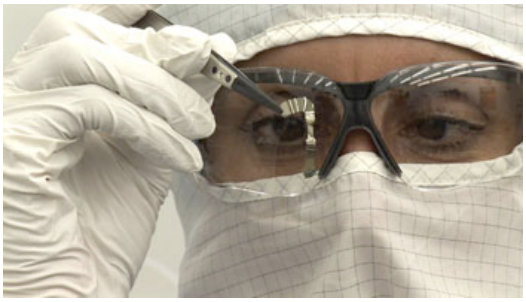
LAWRENCE LIVERMORE
REPORT

A weekly collection of scientific and technological achievements from Lawrence Livermore National Laboratory: Feb. 1 – Feb. 8, 2010

Keeping an eye on vision improvement



Artificial retina team member Terri Delima holds a thin-film artificial retina array in the LLNL clean room.

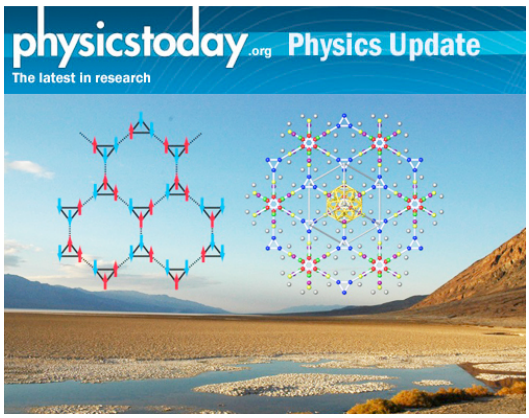
Scientists and engineers at Lawrence Livermore are now developing the electronics for a third-generation artificial retina as part of the U.S. Department of Energy (DOE) project to produce an "epiretinal prosthesis" that could restore vision to millions of people around the world suffering from eye diseases.

The DOE artificial retina project brings together five national labs, four universities and a private company, with the Laboratory serving as the lead organization for the implantable artificial retinal system.

Researchers at Lawrence Livermore are today using advanced polymer-based micro-fabrication methods to further develop a biocompatible microelectrode array for the third-generation artificial retina device.

To see a video about the project, go here https://publicaffairs.llnl.gov/news/video/retina.mov

Boron's structure is anything but crystal clear



Superimposed over this photo of Badwater in Death Valley is one image (left) of the underlying model of boron and another image (right) shows the locations of partial occupancy in a boron crystal.

Anyone who has ever studied basic chemistry knows that all elements, with the exception of helium, solidify into an ordered crystal structure at low temperatures, and those crystals are supposed to become perfect if you wait long enough.

But the basic elemental ground state of the fifth element -- boron -- has confused scientists for more than 30 years. Simply put, boron doesn't fit into that orderly crystal structure.

However, Lawrence Livermore scientists in collaboration with researchers from the University of California, Davis and the University of Tokyo have made a breakthrough in understanding this problem by identifying the underlying model describing the state of defects in elemental boron.

To read more, go to http://blogs.physicstoday.org/update/2010/01/geometrically-frustrated-boron.html

Livermore helps with measurement of methane

California plans to install a network of computerized monitors to measure methane emissions from regions that are home to dairy ranches, farms, landfills and other sources and the Laboratory is here to help.

From these measurements, the state can work toward reducing those emissions that are related to global warming.

By May, seven devices about the size of a personal computer will be placed in regions of the state where methane emissions are believed to be the highest. Those include the farm fields of the Sacramento and San Joaquin valleys and landfills in the Los Angeles basin.

Data from the air board's seven monitors will be combined with measurements taken from other monitors along California's coast run by Lawrence Livermore, NASA and NOAA to provide a more complete picture of methane emissions throughout the state.

To read more, go to http://www.contracostatimes.com/search/ci_14321127?IADID=Search-www.contracostatimes.com-www.contracostatimes.com

National Ignition Facility results light up

A NIF technician checks the target positioner.

The first experiments at the Laboratory's National Ignition Facility (NIF) have demonstrated a unique physics effect that bodes well for NIF's success in generating a self-sustaining nuclear fusion reaction.

In inertial confinement fusion (ICF) experiments on NIF, the energy of 192 powerful laser beams is fired into a pencil-eraser-sized cylinder, which contains a tiny spherical target filled with

deuterium and tritium, two isotopes of hydrogen. Rocket-like compression of the fuel capsule forces the hydrogen nuclei to combine, or fuse, releasing many times more energy than the laser energy that was required to spark the reaction. Fusion energy is what powers the sun and stars.

The interplay between NIF's high-energy laser beams and the hot plasma in NIF fusion targets, known as laser-plasma interactions, or LPI, has long been regarded as a major challenge in ICF research because of the tendency to scatter the laser beams and dissipate their energy. But during a series of test shots using helium- and hydrogen-filled targets last fall, NIF researchers were able to use LPI effects to their advantage to adjust the energy distribution of NIF's laser beams.

To read more, go to http://www.rdmag.com/News/2010/02/Energy-Closer-to-the-goal-Initial-fusion-ignition-experiments-published/

Lab wins two pollution prevention awards

New landscaping next to the Laboratory's Central Cafeteria includes six underground fiberglass holding tanks used to store captured rainwater for future irrigation use.

The Laboratory has won two pollution prevention awards from the Department of Energy.

The lab won the awards for two different projects -- one to catch rainwater on a cafeteria roof and use it to water nearby plants, the other to recover magnetic cores used in an electron accelerator for reuse in a new project.

In the first project, the Laboratory installed a system to catch between 90,000 and 210,000 gallons of runoff from a cafeteria roof per year. That water will be used for landscaping irrigation.

The second project took 861 old ferrite cores out of a 1980s-era electron accelerator being demolished. Ferrites are magnetic ceramics of the type used in refrigerator magnets and electrical transformers.

To read more, go to
http://sanfrancisco.bizjournals.com/sanfrancisco/stories/2010/02/01/daily26.html

Latest *Newsline* available

Newsline provides the latest Lab research and operations news. See the most recent issue at https://newsline.llnl.gov

Photo of the week

Bird's eye view: A red tail hawk warms himself in one of the trees at LLNL.

LLNL applies and advances science and technology to help ensure national security and global stability. Through multi-disciplinary research and development, with particular expertise in high-energy-density physics, laser science, high-performance computing and science/engineering at the nanometer/subpicosecond scale, LLNL innovations improve security, meet energy and environmental needs and strengthen U.S. economic competitiveness. The Laboratory also partners with other research

institutions, universities and industry to bring the full weight of the nation's science and technology community to bear on solving problems of national importance.

To send input to the Livermore Lab Report, send e-mail mailto:labreport@llnl.gov.

The *Livermore Lab Report* archive is available at:
https://publicaffairs.llnl.gov/news/lab_report/2010index.html